

DESCRIPTION

The contractor shall furnish and install time base coordinators and harness, as called for in the specification, at the location shown on the plans. The unit shall be in full compliance with the requirements of NEMA Standard TS 1-1976 latest revision, parts 1 thru 4, 13, 14, and the special note County of Monroe Equipment Specifications Electronic Equipment.

MATERIALS**FUNCTIONAL REQUIREMENTS**

The coordination shall provide highly accurate time base to enable various output functions to be turned on or off on a Time-of-Day, Day-of-Week, Week-of-Year function. The coordinator shall be capable of controlling traffic actuated controllers.

The unit shall be capable of providing a minimum of 15 outputs for selection of functions. As a minimum the unit shall be capable of providing the following functions.

1. Hold (Ring 1)
2. Hold (Ring 2)
3. Force off (Ring 1)
4. Force off (Ring 2)
5. Maximum two
6. Phase omits for phase 1 through 8
7. Ped omits for phase 1 through 8
8. System
9. Coordination - call non actuated
10. +24 VDC - External 24 volt supply capable of supplying 250 ma.
11. Voltage monitor - ground true output that shall go high when voltages within the unit vary above or below predetermined levels.

The unit as a minimum shall be capable of receiving the following coordination inputs.
Phase green 1 through 8
External preempt

REAL TIME CLOCK

The coordinator shall be supplied with a 52 week solid state clock. It shall be possible to manually set the 24 hour clock to the day of week, minute and second of day. Each program shall be capable of being set to the second.

The basic timing accurately shall be the 60 Hz power line frequency. All timing error due to power line failure or brown out shall not exceed 0.05% of the duration of those conditions.

COORDINATION

1. General

The controller unit shall be capable of the following coordination features:

- Four cycles
- Four splits per cycle
- Three offsets per cycle
- Three permissive periods per split
- Four force-offs per split
- One pedestrian permissive period
- One dwell period per cycle

Coordination Parameters shall be front panel keyboard programmable from 30-255 seconds in one second increments.

2. Cycle

Four cycles shall be provided.

Cycle shall be selected either by application of 115 volt, 60 Hz AC to the input connector, manually from the keyboard, or by time-of-day, day-of-week, week-of-year programming.

The Processor Module shall provide a visual indication of the cycle currently in effect and the number of seconds into the cycle.

Transfer from one cycle to another shall occur at the end of the cycle in effect.

3. Offsets

A minimum of three offsets shall be provided for each cycle.

Each offset for each cycle shall be individually programmable from 30-255 seconds in 1-second increments. The programmed offset shall define the number of seconds by which the beginning of the cycle follows the receipt of the master sync pulse.

Offset shall be selected either by application of 115 volt, 60 Hz AC to the input connector. Time-of-Day, Day-of-Week, Day-of-Year programming, or manually through the keyboard (when used as a master).

The Processor shall provide a visual indication of the offset currently in effect, and shall count out the offset upon receipt of the sync pulse.

Offset transfer shall use short-way or dwell transfer procedures. If shortway methos

is utilized, the Coordination Unit shall seek a new offset in the shortest direction with the rate of offset change never exceeding 20 percentage points per cycle. The new offset shall never be more than 50% away from the existing offset, and therefore, shall be attained in no more than three cycles.

If dwell (maximum or variable) is utilized, the Coordination Unit shall dwell at the end of the cycle for a programmed period of time (30-255 seconds in 1-second increments), or until a sync pulse is received while the Coordinator is dwelling.

It shall be possible to manually adjust the unit (resync mode) to a desired offset in a non-interconnected system.

4. Force-Offs

The unit shall be equipped to provide a minimum of four independent phase-related Force-Offs.

Phase association for force-offs points, permissive periods and coordinated phase(s) shall be keyboard programmable.

The Force-Off function shall cause the local controller unit to terminate right of way on the programmed phase(s).

Force-Offs shall be maintained until the green terminates.

Either semi-actuated or full-actuated (force-off all phases) control shall be capable of being implemented.

5. Split

Four splits shall be provided for each cycle.

Each split of each cycle shall consist of a minimum of four force-off points.

Split shall be selected either by application of 115 volt, 60 Hz AC to the input connector, manually from the keyboard, or Time-of-Day, Day-of-Week, Day-of-Year programming.

There shall be a visual indication of the split currently in effect.

Transfer from one split to another shall occur, upon command, at the end of the cycle in effect.

6. Permissive Periods

The unit shall be equipped to provide Permissive Periods as follows:

A minimum of three Permissive Periods shall be provided with the start and end periods for each period capable of being set in one second increments. During each permissive period, the coordinator will allow the controller to leave the coordinated phases(s) and selectively respond to Vehicle and/or pedestrian calls as determined by the application of Phase Omit and/or Ped Omit. The programming of the allowable phase(s) to be serviced for each permissive period shall be accomplished through the keyboard.

Programming of the start and end of Vehicle Permissive Periods shall be accomplished through the front panel keyboard.

When a Controller unit has yield to a non-coordinated phase, all successive phases with Vehicle and/or Pedestrian demand shall be served in the normal order of phase sequencing for that controller unit.

Permissive periods shall provide for the release of HOLD and application of Phase Omits as programmed. Once the controller unit enters a non-coordinated phase green, the phase omits shall be inhibited for that ring until a coordinated green becomes active in that ring.

If a coordinated phase green is terminated, but a non-coordinated phase green is not active, the permissive period will remain active in that ring until a non-coordinated green becomes active.

A call for pedestrian service may be recognized during the beginning of each permissive period. The duration of the PED PERMISSIVE (one time setting per unit) period shall be programmable through the use of the front panel keyboard.

7. Free Operation

Free operation shall be in effect under any of the following conditions:

If Master Control Sync signal is not received after three consecutive cycles.

System/Free Input (ground true) will be active while the coordinator is in the Coordination Mode. Absence of the System/Free input will cause the coordinator to go to Free Operation.

Automatic selection of Free Operation shall occur when a particular offset and/or cycle and/or Split combinations are selected by the Master Control. Selection of these parameters shall be front panel keyboard programmable.

If free operation is manually selected through the keyboard.

MANUAL OVERRIDE

Each output function shall be capable of being manually selected by use of the keyboard to be either on, off, or under normal Time-of-Day, Day-of-Week, Day-of-Year control. The cycle split, and offset in effect shall be capable of being manually selected by use of the keyboard to override either external selection of each parameter or that selected by the Time-of-Day, Day-of-Week, Day-of-Year program.

PROGRAM CAPABILITY

The unit shall be capable of the following:

1. A minimum of 10 different day plans
2. A minimum of 10 week programs
3. A minimum of 48 exception days
4. A minimum of 4 cycle length
5. A minimum of 12 offsets
6. A minimum of 3 permissive periods.
7. One pedestrian permissive per permissive period
8. The unit shall be capable of being programmed to accommodate changes from daylight savings time to standard time and vice versa.
9. 4 splits per cycle
10. 4 Force-offs per cycle

DISPLAY

The coordination unit shall be able to display both information stored in memory (Program/Read mode) as well as current operational data (Run Mode).

The Processor shall be capable of displaying all data entered into RAM including the following:

1. On/off status of each circuit for each day program
2. Indicates which day program constitute each week program
3. Indicates which week program constitute each year program
4. Indicates exception day programming
5. Exception days
6. Stored cycle lengths, offset time and dwell times
7. Day and week of year daylight savings time takes place and viceversa.
8. Programming for force offs and permissive periods
9. Programming for Free Operation

In the run mode the unit shall be capable of displaying current operational information including:

1. Real time in hours, minutes, seconds
2. Day of week
3. Week of year
4. Cycle, offset, and split in effect
5. Cycle counting
6. Offset counting
7. Day program in effect
8. Week program in effect

The unit shall have LED's to display as a minimum the following:

1. Battery status
- 2) Status of output circuits
3. Watchdog or RAM checksum
- 4) Status of holds, Force offs, Permissive periods

All LED's shall be located on the front of the unit.

SECURITY CODE

A security code shall be capable of being entered in RAM. It shall be possible to operate the unit when a security code has not been programmed.

DIAGNOSTIC ROUTINE

The unit shall contain a diagnostic routine to check the memory contents and the input and output circuits. If an error is found the unit shall display an error code to enable the technician to repair the unit.

PRINTER CAPABILITY

The unit shall be capable of interfacing with a data printer to provide hard copy of all data stored in RAM.

The printer shall be capable of interrogating the unit without affecting normal operation.

Activation of the printer shall be accomplished by a keyboard instruction.

MEMORY TRANSFER

The unit shall be capable of transferring stored data to another unit.

CONSTRUCTION DETAILS

The controller unit shall consist of a main frame, suitable for shelf mounting, with printed circuit card cage and backplane to house interconnect all operating modules.

Programming the controller shall be accomplished by establishing all timing intervals and selecting all modes of operation by means of adjustments which are directed accessible from the front of the controller. This would exclude portable type programmer/display units. All programming shall be by means of front panel mounted keyboard.

This keyboard shall employ discrete keys which give "tactile feedback" and not visual evidence of excursion when exercised. The keyboard shall not be an integral part of the coordinator unit front panel, but shall be removeable, in its entirety, from the front panel for service and/or replacement.

Quarter turn "twist lock" connectors shall be provided for interconnecting all inputs and outputs with their external control circuits and devices. All contacting connector surfaces shall be plated a minimum of 30 millionths inch gold over 5 ten thousandth inch nickel. The connector shall be of sufficient length to permit placement of the unit anywhere in a P size cabinet.

Indicators shall be as specified in NEMA Standard Ts1-1976 (thru Rev.2), or latest revision.

MECHANICAL REQUIREMENTS

MAIN FRAME

The main frame shall provide housing, mounting, and all necessary internal interconnection. The main frame shall be equipped and wired with a card cage and a backpanel with appropriate connectors to receive a full complement of plug-in modules. All plug-in modules shall be easily removeable from the card cage without the use of special tools, or unit disassembly. All modules shall be removeable from the front of the unit.

SIZE

Maximum dimensions of the main frame shall be

Height 17"

Depth 13" (including connector protusion)

Width 19"

FINISH

All exterior surfaces to the main frame shall be etched and painted if aluminum, or primed with a zinc chromate primer and painted if a ferrous metal. Anodized surfaces shall be permitted.

ELECTRICAL REQUIREMENTS

POWER

The controller unit shall be designed for use on nominal 120 volt, (within a range of 95 to 135 volts) 60 Hz single phase alternating current.

POWER DISTRIBUTION

The main frame and card cage with backplane shall distribute all necessary operating power from the power supply module to all other modules of the coordination unit. "Crowbar" typw SCR surge protection circuits shall be provided to protect all components from power surges.

PROTECTION

The main frame shall be provided with a fuse for the 120 volts, 60 Hz A.C. supply to the unit and a fuse for the 24 volt D.C. external output from the unit.

BATTERY BACK-UP

The coordination unit shall contain a sealed Lead Acid "Gel-Cell or Nicad" type battery capable of maintaining sufficient power to the RAM to protect, intact, any operation programmed data in the RAM for a period of at least 30 days without 120V, 60Hz A.C. input to the unit. Under normal operating conditions the battery shall be maintained in a fully charged state through a trickle charge from the power supply module. The battery shall be mounted on the RAM card so that memory is maintained wirth the board removed from the coordination unit. The board shall be protected ahainst the possibility of battery leakage. There shall be present in the coordinator an easily accessible indicator light that will be illuminated when the battery is in a discharged state.

SWITCHES AND CONNECTORS

The coordination unit switches and connectors and any other components required for operation and adjustments of the unit shall be mounted on the front panels. All component parts and terminals shall be readily accessible when the modules are removed for maintenance, testing and servicing.

CUSTOM CIRCUITS

The use of custom LSI integrated circuits in the coordinator unit is expressly prohibited.

ENVIRONMENTAL REQUIREMENTS

The coordination unit shall meet the environmental conditions required of control equipment as specified in NEMA Standard TS1-1976, latest revision in effect at time of contract award.

QUALITY ASSURANCE REQUIREMENTS

The coordination unit shall meet the following factory acceptance test and design approval test requirements in accordance with Section 6.1 of the equipment specifications electronic equipment. The contractor shall prepare all required test procedures and data forms for approval by the Engineer-in-Charge.

FACTORY ACCEPTANCE TESTS

The bidder or manufacturer shall conduct or cause to be conducted, as a part of the factory acceptance test procedure, environmental testing of all units delivered under this contract.

The environmental test procedures to be followed shall be those of the transient voltage, temperature, low voltage and high voltage portions of the environmental tests specified in the NEMA Standards Publication for Traffic Control Systems TS1-1976, latest revision in effect at time of contract award.

The bidder or manufacturer shall furnish all data taken during these tests to the Engineer-in-Charge.

DESIGN APPROVAL TESTS

The design approval tests specified in NEMA Standard Ts1-1976 latest revision at time of contract award shall be satisfied.

METHOD OF MEASUREMENT

Each coordination unit in place and accepted by the Engineer-in-Charge will each be measured as a single unit.

BASIS OF PAYMENT

Payment for each coordination unit will be made for the measured quantity at the contract price per each. The unit price shall include all labor and materials for furnishing, installing and adjusting all equipment and incidentals necessary to meet the specifications.

Sixty five (65) percent of the contract bid price shall be paid upon completion of the installation, design and approval and factory acceptance test.

Twenty five (25) percent of the contract bid price shall be paid upon completion of the intersection wiring and operation.

Ten (10) percent shall be paid upon contract acceptance.

DESCRIPTION

The contractor shall furnish and install a master time base coordinator at the location shown on the plans. The master coordinator shall be in exact accordance with the requirements of Item 686.9960 with the following additions.

MATERIALS**FUNCTIONAL REQUIREMENTS**

1. The master time base coordinator shall be supplied with all diagnostic programs to trouble shoot all coordinators.
2. The master time base coordinator shall be supplied with a Program Prom Burner capable of copying and transferring programs from programmed chips to unprogrammed chips.
3. The master time base coordinator shall be supplied with an alphanumeric printer meeting the following requirements:
 - A. The Printer Unit shall be a portable unit with for field use or be capable of being used in the shop or office suitable for being hand held.
 - B. Activation of the printer shall be accomplished through the front panel keyboard located on the Coordination Unit under interrogation.
 - C. The Printer shall operate on 120 volts, 60Hz AC (or 230 VAC 50 Hz) input. The Printer shall have a 3 wire electrical cord for power connection.
 - D. The Printer output shall be accomplished by means of a phone jack. The jack shall have a two wire connection to logic ground and the other to the printer output.
 - E. The Printer Unit shall be no larger then 7.5"W X 2.9"H X 5.4"D.
 - F. The Printer shall have a power-on indicator located on the front panel to indicate when power (120 VAC) is applied.
 - G. The Printer shall have a paper spindle located on the rear of the unit to hold a roll of electrosensitive paper.
 - H. The Printer shall be capable of double-front and alphanumeric printing.
 - I. The Printer shall print two lines per second maximum.
 - J. The Printer output shall be rated at 20 MA at 300 Baud.
 - K. During print out operation, the Printer shall not affect the cyclic operation of the unit under interrogation.
4. The master time base coordinator shall be furnished with two sets of extended cards to allow the modules to be operated outside of the controller housing for trouble shooting purposes, and any special test equipment necessary to trouble shoot the

unit.

METHOD OF MEASUREMENT

Each master coordination unit in place and accepted by the Engineer-in-charge will be measured as a single unit.

BASIS OF PAYMENT

Payment for each master coordination unit will be made for the measured quantity at the contract price each. The unit price shall include all labor materials for furnishing, transporting, installing and adjusting all equipment and incidentals necessary to meet the specifications.

Sixty five (65) percent of the contract bid price shall be paid upon completion of the installation design and approval and factory acceptance test.

Twenty five (25) percent of the contract bid price shall be paid upon completion of the intersection wiring and operation.

Ten (10) percent shall be paid upon contract acceptance.